

## ABSTRACT OF THE DISCLOSURE

5           An ultrathin gate dielectric having a graded dielectric constant and a method for forming the same are provided. The gate dielectric is believed to allow enhanced performance of semiconductor devices including transistors and dual-gate memory cells. A thin nitrogen-containing oxide, preferably having a thickness of less than about 10 angstroms, is formed on a semiconductor substrate. A silicon nitride layer having a  
10           thickness of less than about 30 angstroms may be formed over the nitrogen-containing oxide. The oxide and nitride layers are annealed in ammonia and nitrous oxide ambients, and the nitride layer thickness is reduced using a flowing-gas etch process. The resulting two-layer gate dielectric is believed to provide increased capacitance as compared to a silicon dioxide dielectric while maintaining favorable interface properties with the  
15           underlying substrate. In an alternative embodiment, a different high dielectric constant material is substituted for the silicon nitride. Alternatively, both nitride and a different high dielectric constant material may be used so that a three-layer dielectric is formed.

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856027-24620260